Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC20554

In the Matter of	)	
	)	
	)	PS Docket No. 17-239
Wireless E911 Location Accuracy Requirements	)	and
	)	PS Docket No. 18–261
	)	
	)	

COMMENTS OF THE DECT FORUM

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COMMENTS OF THE DECT FORUM

The DECT Forum submits these comments on the above captioned proceedings.[1] In these comments the DECT Forum presents an overview of the DECT standards and technology. The comments then offer initial reflection on the ability of systems that use DECT technology to comply with the rules proposed in this proceeding. Many of these rules do not involve DECT, but apply to other system components, in which DECT may be used. The comments go on to describe the role DECT plays in telephony, with particular focus on its role in Multiline Telephone Systems (”MLTS”). Finally, some further study of the DECT Forum are described, intended to provide greater insight into these matters.

I. ABOUT THE DECT FORUM

The DECT Forum is an international industry association embracing suppliers and operators of DECT based terminals, systems, and networks. DECT stands for "Digital Enhanced Cordless Telecommunications" and denotes a radio technology suited for voice data and networking applications with range requirements up to a few hundred meters.

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[1] PS Docket Nos. 18–261, 17–239; FCC 18–132, Improving the 911 System by Implementing Kari’s Law and RAY BAUM’S Act.

The DECT Forum represents the interests of the DECT industry with the following primary objectives:

- To promote DECT as the worldwide cordless communication standard.
- To pursue worldwide harmonization of frequencies for DECT products.
- To provide an interactive forum for sharing information and experience between regulatory and standardization agencies, operators, users and manufacturers.
- To manage the evolution of DECT to protect legacy investments and permit orderly service migration and expansion.

The ongoing development of DECT will be discussed later in these comments. First, we will discuss the perspective of the DECT Forum on the specific questions raised in this proceeding.

II. TECHNOLOGICAL COMPLEXITY OF MLTS & ECS SYSTEMS

DECT radio protocols are often used to provide wireless connectivity in Multiline Telephone Services (MLTS) & Enterprise Communication Systems (ECS). As such, DECT provides wireless connectivity which can then be used in combination with a wide variety of other technologies and system components to create an impressive and continually changing array of systems. We agree with TIA's presentation of the complexity of today's telephone systems:

> ECS is a descendant of Multiline Telephone Services ("MLTS"). MLTS was a term utilized to describe physical network attributes that delivered to a business the opportunity to use multiple lines.[2] ECS could be a complex on-premises system (typically for larger enterprises), a Private Branch Exchange ("PBX") system for smaller enterprises, or a Centrex system for enterprises that

[2] MLTS is defined by the Next Generation 9-1-1 Advancement Act of 2012, implemented as part of the Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96 (2012), as "a system comprised of common control units, telephone sets, control hardware and software and adjunct systems, including network and premises based systems, such as Centrex and VoIP, as well as PBX, Hybrid, and Key Telephone Systems (as classified by the Commission under part 68 of title 47, Code of Federal Regulations), and includes systems owned or leased by government agencies and non-profit entities, as well as for profit businesses." 47 USC 1471.

wanted the local telephone company to maintain the company exchange for them. The Commission is quite correct that the descendants of MLTS now represent a wide array of technologies and technical capabilities, making the issue of enterprise connectivity to the emergency calling system an intricate and complex issue.[3]

The diversity of enterprise users and system architectures in the ECS marketplace cannot be overstated. ECS solutions exist in organizations spanning the spectrum of small, medium, and large; and can make use of legacy circuit-based equipment, Voice-over-Internet-Protocol ("VoIP"), web-based applications, or various combinations thereof. ECS handsets can each be supported by their own phone number or be assigned extensions inside a single phone number. They can be softphones on a laptop, or applications on a mobile phone. In the optimal scenario, enterprises determine the prefix number necessary to reach an outgoing line, whether the system will make use of Private Switch/Automatic Location Information ("PS/ALI"), to what location equipment is registered in the ALI database, and the granularity with which individual handsets' locations are specified. However, this scenario is not always reality. Over the top ("OTT") VoIP, Virtual Private Network ("VPN"), and cloud or hosted technologies may not have technical capabilities analogous to the "traditional" multiline telephone services of the past, rendering a "one size fits all" approach to emergency calling requirements impracticable.

Even in ECS offerings where equipment is sold to an enterprise, there are complexities in how that equipment is installed and operated. In many cases, equipment manufacturers market only the equipment, via national or regional distribution channels. Distributors in these channels then sell to local or regional integrators, which themselves may integrate a third-party service solution. VoIP ECS may be used for internal or external extensions to either an IP phone or a software client.[4] These internal extensions may be located inside the enterprise network firewall or may use a VPN connection to a remote worker. Additionally, applications-based ECS using VoIP is also available, typically utilizing an employee's smartphone and running on Wi-Fi.

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[3] *See generally* 911 ECS NOI, fn. 2.

[4] VoIP phones require the presence of electrical power and a connection to the Internet to function. In contrast, circuit-based systems are powered by their phone lines and require only a connection to the Public Switched Telephone Network ("PSTN") to function. This is of importance during natural disasters, where the PSTN-based network may survive when the power grid fails, but VoIP can be used only so long as backup power is available.

Generalizing the use of IP versus circuit-based solutions in the ECS marketplace is difficult without considering the varying size and complexity of the different enterprises making use of ECS equipment. However, industry reports indicate that premise communications systems make up 60% of total ECS installations, while hosted systems make up the remainder.[5] The use of IP-based ECS equipment is increasing, however. Reports show growth in the market for hosted ECS services and slight decline in the premise-based market.[6] As discussed previously, however, this varies widely depending on the size and configuration of a given enterprise. Speaking broadly, small businesses are more likely to make use of circuit-based solutions due to simplicity, cost-effectiveness, and the availability of circuit power during a power outage.

Enterprises typically connect to the local telephone exchange, and because of state regulation, the local exchange service enables connectivity to the PSAP. From there, the pathway tends to become far more complex. Three issues in emergency calling constitute the hallmarks of today's E911 and tomorrow's Next Generation 911 ("NG911") system: location, routing to the correct PSAP, and call back number.[7] While many ECS offerings provide a caller's call-back phone number to the PSAP, not all are configured to do so. In some cases, the call back number is the enterprise's main phone number. Location information tends to be obtained and delivered in systems that more closely resemble traditional MLTS, where handsets were hard-wired to a location. In today's plug-and-play environment, however, nomadic handsets, softphones, and applications make location services a challenge. Vendors offer some solutions for determining location within an enterprise for IP phones, but offerings such as cloud solutions, application-based ECS, and VPNs remain a technical challenge. These are not new problems or unique to

[5] "Unified Communications Market Worth $143.49 Billion By 2024," Grand View Research, http://www.grandviewresearch.com/press-release/global-unified-communication (last accessed Nov. 15, 2017).

[6] "Taking the Pulse of the Enterprise Communications Platforms & Endpoints Market," Frost & Sullivan, http://digitaltransformation.frost.com/expert-insights/viewpoints/taking-pulse-enterprise-communications-platforms-endpoints-market/ (last accessed Nov. 15, 2017).

[7] *See generally* National Emergency Numbers Association, "Baseline NG9-1-1 Description," https://www.nena.org/?NG911_Baseline, (last accessed Nov. 15, 2017)

> enterprise—the Commission is very familiar with the issues surrounding location for interconnected VoIP providers.[8] Challenges with routing naturally accompany these location challenges, as well.[9]

Emergency calls made using DECT devices inherit the capabilities of the systems in which they are used. The best achievable device location information can be added to the dispatchable location information from the system. Typically, the DECT device cannot improve on the location information provided by the system. Many of the concerns addressed in this proceeding, such as direct response to any 911 call, must be addressed by the system and are not the function of the DECT device. The additional complexity added by a mobile device is that they add location uncertainty to the location information for the base equipment the mobile device is connected to. In most cases, the location of a mobile device will not be as precisely known as that of stationary equipment.

III. CURRENT DECT SUPPORT FOR 911 CALLS

We believe Cisco provides an accurate summary of the ability of current technology to meet the requirements proposed in this NPRM:

> More generally, Cisco represented that generating a dispatchable location is not uniform over MLTS systems, with dispatchable location more supportable from wired MLTS, more difficult

[8] *See generally* Federal Communications Commission, Legal and Regulatory Framework for Next Generation 911 Services, Report to Congress and Recommendations, Feb. 22, 2013, https://ecfsapi.fcc.gov/file/7022125743.pdf, Sec. 3.1.1.3, ("As with wireless E911 service, the mobile nature of interconnected VoIP service presents challenges to routing the 911 call and locating the caller. Because a VoIP user may place an emergency call from outside his or her home area, the caller's permanent telephone number cannot be used for routing. Thus, VoIP providers must use similar methods to wireless carriers to route the call to the appropriate PSAP and provide the PSAP with a call-back number for the end user. However, the difficulties in determining the geographic location of callers are even more acute with VoIP service.").

[9] Comments of the Telecommunication Industry Association file in FCC PS Docket 17-239 on Nov. 16, 2017.

> for wireless, and difficult to impossible for off premises softphones using public Internet or Virtual Private Network (VPN) connections. Cisco stated that while employees can update location when using a softphone, there is a trade-off between prompting such updates and user fatigue. For on-premises use of softphones, third party vendors have the capability to update client location, and the CER is designed to facilitate these third-party solutions, which can look at changes in network activity such as changes to SSID or IP address.[10]

We concur that wireless connections, such as DECT, are more difficult. The location of the base a DECT device is connected to can be provided. In addition, an estimate of the distance of the handset from the base can be provided. However, the vertical accuracy and direction of the handset from the base are not achievable for current technology.

In MLTS systems, handsets generally see multiple access points. The access point used depends on many factors, including call density. A handset will not necessarily use the nearest access point. Handset could easily be 20 meters away from the access point it is using, even when other access points are closer to it.

DECT generally provides a wireless link for handsets, headsets or microphones to a base unit. The base unit may then use any available technology to connect to the PSTN (Public Switched Telephone Network) or IP (Internet Protocol) networks. The location accuracy can be divided into two parts. The first part is the accuracy of the location information of the base unit. Then there is the location information from the DECT connected unit from that base. Handsets in an enterprise deployment may be at some distance or on a different floor, above or below the base. In addition, a handset may be configured to roam, connecting to the nearest base or PBX,

[10] Letter from Mary L Brown, Senior Director, Government Affairs, Cisco Systems, Inc., to Marlene H. Dortch, Secretary, FCC, PS Docket No. 17-239, filed May 7, 2018.

in a multi-PBX configuration. Further, systems that allow call forwarding bring additional uncertainties.

We are currently surveying our member companies and plan to provide additional detail in our reply comments.

IV. DECT STANDARDS SUPPORT NEW NEEDS WITH ONGOING DEVELOPMENT

The DECT standards are not static but a dynamic family of standards. In recent years the DECT standards have added support for high definition voice, integrated voice and data services and low energy transmissions. These changes came in response to specific needs, illustrating the expanding role of DECT protocol devices. As will be discussed in the next section, DECT standards continue to develop with work actively underway on DECT-5G.

Figure 1 – Development of DECT from 3G to 5G

High definition voice is a major step forward in recent years. Traditional telephony was limited to a guaranteed 3 kHz, although analog telephony often provides much wider bandwidth. With the introduction of digital technologies and particularly wireless transmission, with

bandwidth sensitivities, the 3 kHz bandwidth became much more strictly controlled. The result has been low quality voice. The loss of full voice fidelity affects all users, particularly in noisy environments, where the sensitivity to background noise is much higher than when provided with high definition, full bandwidth voice.

For emergency calls the 3 kHz bandwidth limitation of voice is particularly impacting. Loss of the full voice bandwidth means that a 911 operator will have greater difficulty understanding a person calling from a noisy environment. It also means the operator may not be able to correctly understand the significance of what they are hearing in the background. For example, if a gunshot is heard by the operator over the restricted 3 kHz bandwidth, the resulting distortion makes it highly likely that the operator will not recognize that a gunshot occurred while the caller was talking to them although they heard some kind of loud noise. With high definition voice the operator would be able to recognize the significance of the sound of the gunshot and take appropriate action.

High definition voice has been put into the DECT standards. Products supporting it are already shipping. However, transmitting high definition voice requires more bandwidth. In response to a petition from the DECT Forum the Commission saw fit to modify the rules for the UPCS band in March of 2012.[11] By this action the Commission insured the unhindered deployment of high definition voice products in the UPCS band. A consequence of this positive development has been that systems increasingly provide consumers with improved voice quality. For the purposes of this proceeding, 911 operators will be able to accurately gain information from background sounds, adding important information to what the caller is saying.

[11] FCC 12-33.

Figure 2 – CAT-iq logo

CAT-iq technology was launched at the ITU Telecom World 2006 in Hong Kong in December 2006, responding to the growing need for integration of voice and data services in a high-quality environment. CAT-iq stands for Cordless Advanced Technology - internet and quality. While CAT-iq is positioned as a broadband telephony application, it embraces technology convergence with other application fields, **Error! Reference source not found.**.

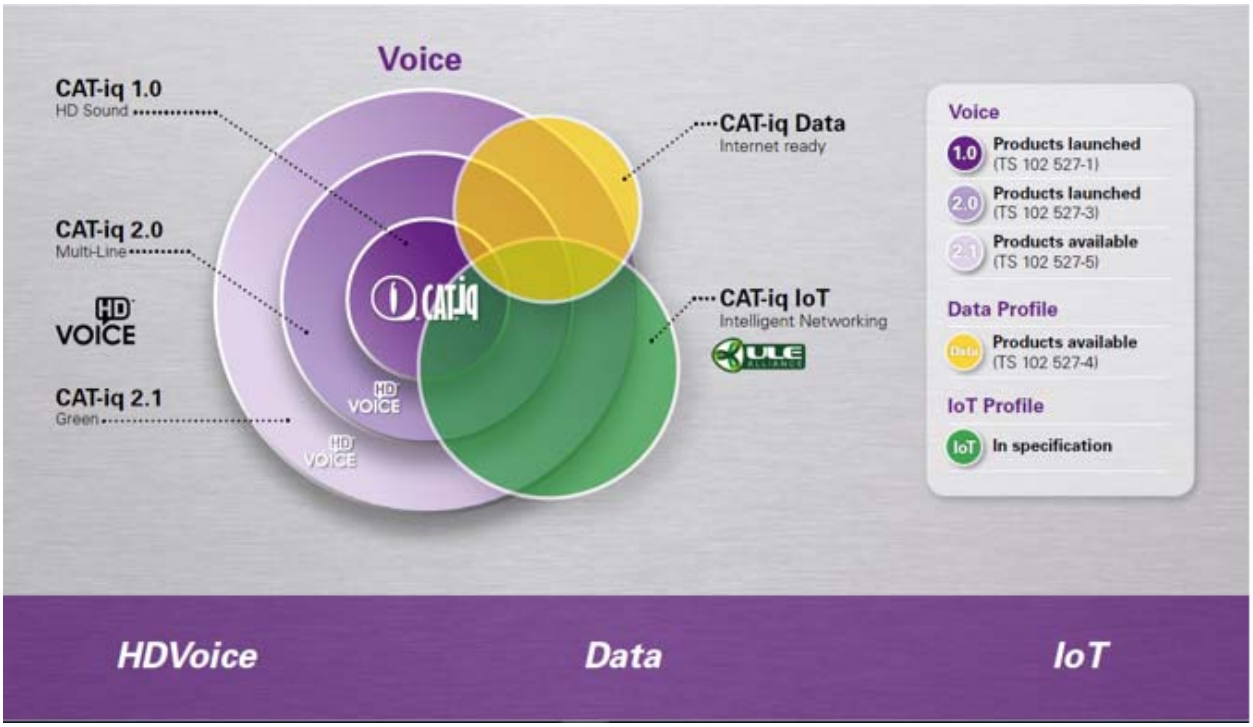

Figure 3 – DECT, CAT-iq and ULE coordinate to cover a broad range of applications

The DECT Forum is responsible for the DECT/CAT-iq industry and is guiding its development and the certification of the CAT-iq products. CAT-iq is designed for the next generation of IP-voice and IP-radio services, with plans for migration into the home gateways, enabling consumers to manage their home communication, information and entertainment needs.

Organizationally, DECT CAT-iq is a collaborative effort of multiple organizations. The DECT Forum represents the DECT/CAT-iq industry, including equipment manufacturers and chip suppliers. It drives the certification program to guarantee interoperability and promotes the technology globally. The Home Gateway Initiative is the industry association for major operators. CableLabs brings the cable operators views and seeks to ensure that CAT-iq meets the needs of the cable industry. CableLabs advices and supports prioritization of use cases and feature sets of new technologies and interoperability. The European Telecommunications Standards Institute (ETSI) creates the standards and test specifications for the certification programs.

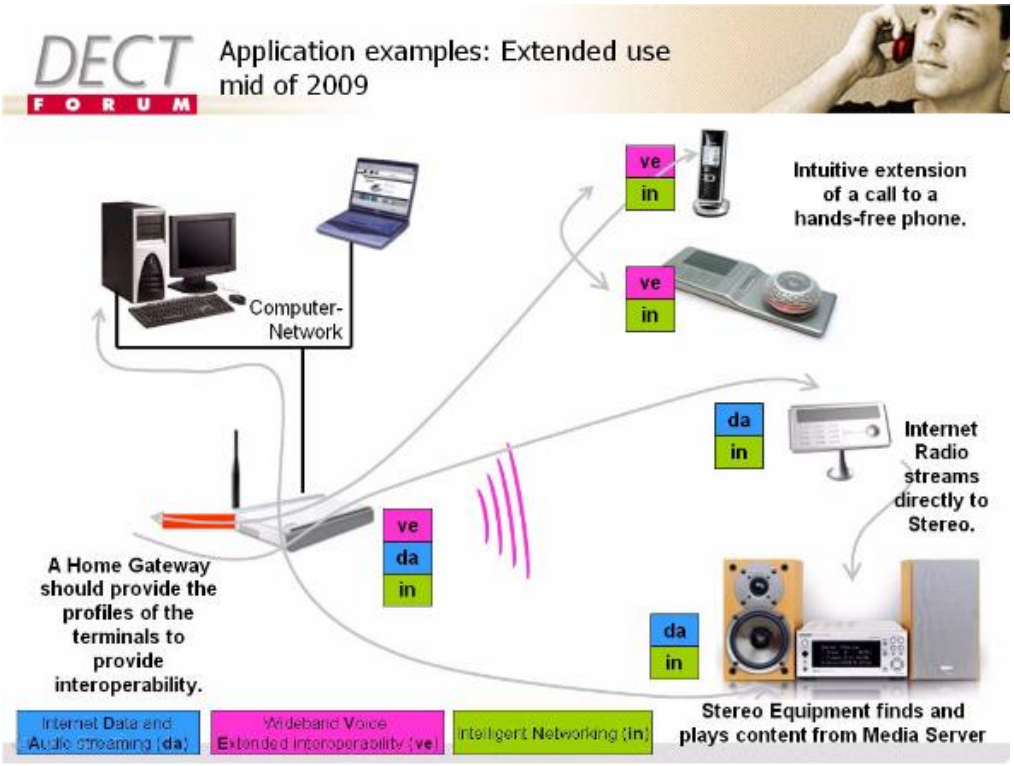

Figure 4 – Examples of Home Applications using DECT

Error! Reference source not found. presents typical home applications. As DECT CAT-iq continues to develop new applications and support other fields will be added. The

UPCS band and DECT CAT-iq create a compelling solution for applications that require a high level of interference protection and assured access for communication.

DECT ULE (Ultra Low Energy) is another innovative development in the DECT family of standards. DECT ULE is optimized for low data rate applications. It is primarily intended to support the needs of sensor and control devices. DECT ULE devices and also support CAT-iq to integrate those service profiles, such as providing voice connectivity, when required. The emphasis on quality-of-service (QoS) is a distinctive of DECT ULE, when compared to other low energy services. The low energy (ULE) version of DECT positions it to serve the fast growing and increasingly important machine-to-machine (M2M) market segment. DECT ULE devices will be mainly used for short communications (<500bytes/message) but these systems will often be required to handle a very large number of devices (>400 devices/base).

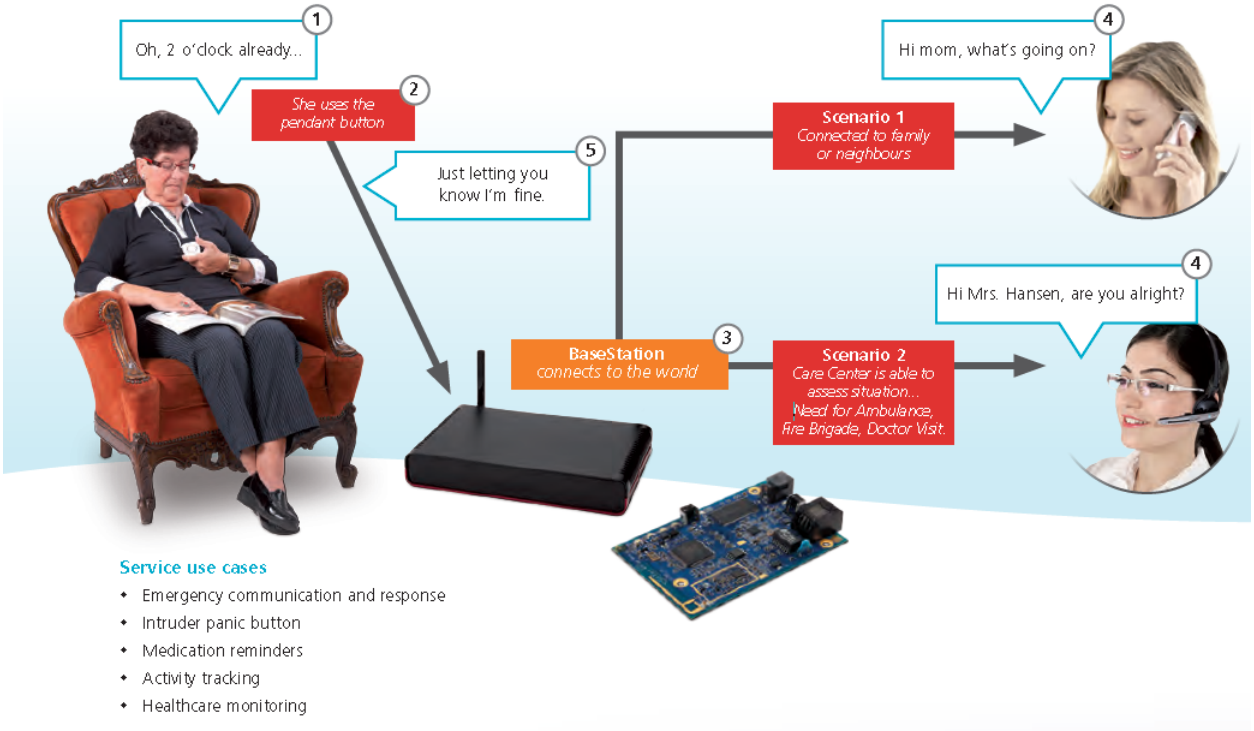

Figure 5 – Dialog Semiconductor's emergency communicator reference design[12]

[12] Illustration from "Emergency communicator reference design product brief" at URL:

The first interoperability tests were conducted by the DECT Forum in June 2011. In September 2011 Dialog Semiconductor announced the first commercially available DECT ULE devices. The initial devices illustrate the potential for DECT ULE devices to serve the home automation and home healthcare fields, as well as commercial and industrial sensor and control systems.

V. DECT-5G AND IMT-2020

Wireless and mobile communication continues its explosive growth in market penetration, the number of use cases, its importance and development of its technology. DECT is an active part of those activities. Subscribers are expected to reach the 1.6 billion mark by 2025. In support of the needs for this growing importance of wireless communication ITU-R (International Telecommunication Union-Radio) is developing the IMT-2020 mobile communications technical specifications, commonly called 5th Generation or 5G. The DECT community is developing DECT-5G, specifying how DECT equipment will operate in the larger IMT-2020 framework.[13]

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http://www.dialog-semiconductor.com/smartpulse.php

[13] Press release, DECT-5G Taking DECT and ULE into the Next Decade DECT Forum Announces Availability of DECT-5G White Paper, Bern, September 17, 2018 and

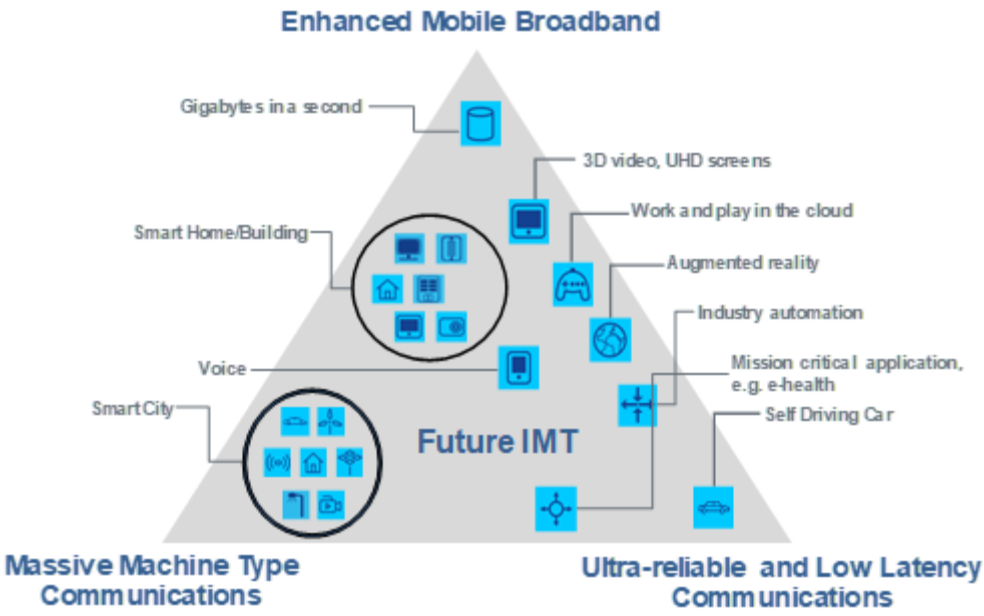

Figure 6 – ITU-R IMT-2020 5G usage scenarios

Today around 80% of data traffic is generated via indoor systems. The key 5G use cases include eMBB (enhanced Mobile Broadband), URLLC (Ultra Reliable Low Latency Communications), and mMTC (massive Machine Type Communications). As predominately indoor technologies, DECT and ULE (Ultra-Low Energy) already address low latency, low power applications for voice and data connected smart homes.

For the purposes of this proceeding it is important to keep both current DECT and DECT-5G in view because in the years ahead it is DECT-5G that will increasingly be the protocol used by DECT equipment. DECT-5G will enable future enhancements that are important to the purposes of this proceeding. However, we are still determining how much that potential will automatically be realized and where additional effort may be needed to realize the full potential of DECT-5G. We anticipate providing the Commission more information in our reply comments.

VI. MIGRATION OF CORDLESS TELEPHONES INTO THE UPCS BAND

The almost complete migration of cordless phones to the UPCS band is both instructive and predictive of the need for unlicensed bands with a high degree of interference protection. Over the years cordless phones have used a number of frequency bands and RF protocols. Early cordless phones used frequencies near 50 MHz. Later, growing demand found the 900 MHz Industrial, Scientific and Medical (ISM) band coming into common use in order to provide additional frequencies in which to operate. More recently the 2.4 and 5.8 GHz ISM band came into common use and grew to dominate as the frequency bands of choice for cordless phones. However, in recent years DECT 6.0, operating in the UPCS band has been growing strongly and is supplanting all the other frequency bands and RF protocols. Today over 70% of the cordless phones sold in the US use the UPCS band using the DECT 6.0 RF protocol. Most major manufacturers have moved all future development to the UPCS band.

Over the years seven frequency bands have been used by cordless phones. These are:

- 1.7 MHz
  (1.64 MHz to 1.78 MHz. This band had up to 5 Channels and was used by analog cordless phones.)
- 43–50 MHz
  (Base: 43.72-46.97 MHz, Handset: 48.76-49.99 MHz, allocated in 1986 for 10 channels, and later 25 Channels, FM System)
- 900 MHz
  (902–928 MHz. Allocated in 1990.)
- 1.9 GHz
  (1920-1930 MHz. Rule changes in 2004 made this band available for general consumer cordless phones, using the DECT 6.0 standard. In Europe, Australia, Asia and Africa uses DECT uses 1880-1900.)
- 2.4 GHz
  (Allocated in 1998, this became a very popular band for cordless phones.)
- 5.8 GHz
  (Allocated in 2003 due to crowding on the 2.4 GHz band this band saw many cordless phones introduced but later lost popularity after the UPCS band became available).

VII. WIRELESS COEXISTENCE

The potential impact of a 911 call failing because of a transmission conflict with another transmission is not mentioned in the proceeding but it is a real risk that almost certainly will result in some 911 calls failing to be successfully delivered. The migration to the UPCS band has largely been prompted by band-crowding and the resulting increase in interference and customer complaints in the ISM bands. The availability of the DECT protocol offered both technological advantages but also significant development and marketing advantages, such as the availability of low-cost chips and components, development tools and support and an internationally recognized standard with a reputation for excellence. This combination is proving to offer overwhelming advantages for cordless phone manufacturers and increasingly manufacturers of other product categories.

The combination of the interference protection integral to the DECT Protocol with the interference protection the Commission put into the spectrum etiquette for the UPCS band create a combination that is arguably the most interference protected and therefore reliable unlicensed band in existence. This means that a 911 call made with DECT equipment is far more likely to be successfully completed than the same call made using one of the other unlicensed bands, in particular, the very crowded 2.4 GHz ISM band.

A search of the FDA MAUDE (Manufacturer and User Facility Device Experience)[14] database reveals that in the last 10 years there have been 115,574 wireless communication failures with medical devices resulting in 12,283 patient injuries and 142 patient deaths. The number of incidents has risen dramatically in recent years and 2018 appears to be on track to set

[14] https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfMAUDE/Search.cfm?smc=1

a record level of communication failures. There is every reason to expect that 911 calls over a wireless service, particularly an unlicensed service, will have a similar experience.

We believe that the interference protections offered by DECT in combination with the UPCS band offer a significant protection for wireless coexistence.

VIII. HIGH RELIABILITY APPLICATIONS NEED UNLICENSED SPECTRUM

The mass movement of cordless phones to the UPCS band is best understood as an early indicator of the increasing need of high reliability applications for unlicensed spectrum that has a high degree of interference protection. Cordless phones would be predicted to be among the first high reliability devices to manifest this need because they are deployed in very large numbers, in a wide variety of use environments and they are used a lot. Further, the manifestation of interference is obvious; the voice of the person you are in conversation with is interfered with. This combination of factors means that cordless phones will be among the first real-time, high reliability services to identify interference problems.

DECT is also finding increasing use as a wireless component in healthcare products. Ascom is one company offering DECT as part of a hospital enterprise solution, integrating clinical, management, financial and technical systems.

Figure 7 – Ascom captions its DECT 6.0 Healthcare products "When Every Second Counts"

The wireless component improves mobility and data delivery. In addition, better process efficiency reduces time to improve the quality of care. Patients receive better information and quicker response to medical alarms. These benefits have the potential to save lives.

Figure 8 – Healthcare Wristband or Pendant[15]

Other innovative healthcare applications are being introduced for hospital enterprise management, elder care and assisted living and home tele-health applications.

First responder equipment is another growing application for the UPCS band. Firecom uses DECT 6.0 for its wireless, under-the-helmet system, Figure 9.

Figure 9 – Firecom's DECT 6.0 Headsets for 1st Responders and Emergency Personnel[16]

[15] NEC Philips M155 DECT Messenger, healthcare watch or pendent http://www.nec-ipdect.com/sheets/M155_messenger.pdf

[16] http://www.firecom.com

Figure 10 – DECT 6.0 used in a Hazmat Communication System[17]

CeoTronics systems, Figure 10, and DECT products from other companies, were developed for use by first responders, firefighters and others working in potentially explosive environments. This is another example of a class of products where interference free communication is a high priority.

These advantages are inherent with DECT technology when used in a band with regulatory service rules that extend its interference protection. Simply put, an emergency call using a DECT device is more likely to get through.

[17] Ceotronics Hazmat communications system

IX. CONCLUSIONS

DECT technology has become the dominate RF protocol used by cordless telephones, both for residential, small business and enterprise applications. DECT standards have a continuing trend of development and adoption. This trend is currently best evidenced in the active development of DECT-5G standards, as part of the larger 5G efforts of the ITU-R IMT-2020 effort.

There are challenges for current generation equipment meeting the proposed rules in this NPRM. The DECT Forum is actively consulting with its members and will provide further insight on this topic in its reply comments. We recognize the public policy the Congress advanced with Kari's Law and Ray Baum's Act. We support the objectives of the Commission and look forward to working with it to realize the earliest realistic implementation of those objectives.

Respectfully submitted,
DECT FORUM

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